भारतीय मानक
Indian Standard

IS 13902 (Part 1) : 2022

सामान्य प्रयोजनों हेतु तार की रस्सियों के लिए सॉकेट

भाग 1 स्वीकरण की सामान्य विशेषताएं और अवस्थाएं

(पहला पुनरीक्षण)

Sockets for Wire Ropes for General Purposes

Part 1 General Characteristics and Conditions of Acceptance

(First Revision)

ICS 77.140.65

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Wire Ropes and Wire Products Sectional Committee, MED 10

FOREWORD

This Indian Standard (Part 1) (First revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Wire Ropes and Wire Products Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first published in 1993. This standard is being revised again to keep pace with the latest technological developments and international practices. In this revision, the following major changes have been made :

1) A reference clause has been added mentioning the latest version of all the referred standards
2) Editorial corrections have been done

Sockets of the type specified in this standard may be re-used, provided that the temperature necessary to remove the rope does not affect the properties of the material used in its manufacture. Sockets may be heat-treated, if necessary

Each design of socket should be used only with the method or methods of socketing which have proved satisfactory by prototype testing.

Generally, the prototype tests for sockets will relate to a particular design, material and method of manufacture. Any change in that design, material or method of manufacture may require further prototype testing. It is the responsibility of the manufacturer to ensure that the modified socket meets the requirements of this Standard.

This standard has been issued in several parts. The other parts of this Indian Standard are :

1) IS 13902 (Part 2) : 1993 — Special requirements for sockets produced by forging or machined from the solid.
2) IS 13902 (Part 3) : 1993 — Special requirements for sockets produced by casting.

The composition of the committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SOCKETS FOR WIRE ROPES FOR GENERAL PURPOSES

PART 1 GENERAL CHARACTERISTICS AND CONDITIONS OF ACCEPTANCE

(First Revision)

1 SCOPE

This standard lays down the dimensions necessary for interchangeability and specifies prototype test requirements and quality control of steel sockets for use with steel wire ropes within the nominal diameter range of 8 to 60 mm. These sockets are not suitable for use in conjunction with locked coil and spiral strands. This standard applies to sockets which are made by one of the following methods of manufacture:

a) Forged or machined from solid and used as terminal attachments for steel wire ropes

2 REFERENCES

The standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. In case the standards are to be referred in this clause they are to be listed as follows:

IS No	*Title*
3937 (Part 1) : 1974	Recommendations for socketing of wire ropes — Part 1 Socketing with zinc *(first revision)*
3937 (Part 2) : 1974	Recommendations for socketing of wire ropes — Part 2 Socketing with white metal *(first revision)*
3937 (Part 3) : 1993	Recommendations for socketing of wire ropes — Part 3 Socketing with resins
5517 : 1993	Steels for hardening and tempering — Specification *(second revision)*
4432 : 1988	Specification for case hardening steels *(first revision)*

3 TERMINOLOGY

For the purposes of this Standard, the following definitions apply.

3.1 Socket Type 1 — A fitting of the open type consisting of a body and pin (*see* Fig. 1).

3.2 Socket Type 2 — A fitting of the closed type consisting of a body only (*see* Fig. 2).

4 SOCKET MANUFACTURE

4.1 Form

Sockets complying with this Standard shall be either of the (open) type 1 or of the (closed) type 2, as shown in figures 1 and 2. Sockets shall be designed to allow for the removal of the cast cone, i.e. the maximum diameter of the conical bore of the basket of the type 1 socket shall not exceed the internal distance between the lugs.

4.2 Material

Sockets shall be manufactured from anyone of the following types of steels :

a) Steel conforming to 20C15 of IS 5517, and

b) Steel conforming to $20Ni_2Cr_2Mo_2$ of IS 4432.

4.3 Heat treatment

All components of socket, after all forging and welding operations during manufacture and repair shall be heat-treated to get optimum mechanical properties.

After heat treatment, hardness of various materials for various components shall be as given below :

Sl No. (1)	**Materials/Part** (2)	**Hardness HV** (3)
i)	20C15	200 to 230
ii)	$20Ni_2Cr_2Mo_2$	250 to 280
iii)	Bridle chain	270 to 330

4.4 Critical dimensions

The critical dimensions of sockets shall be as specified in table 1 and illustrated in figures 1 and 2,

Table 1 Dimensions of Sockets

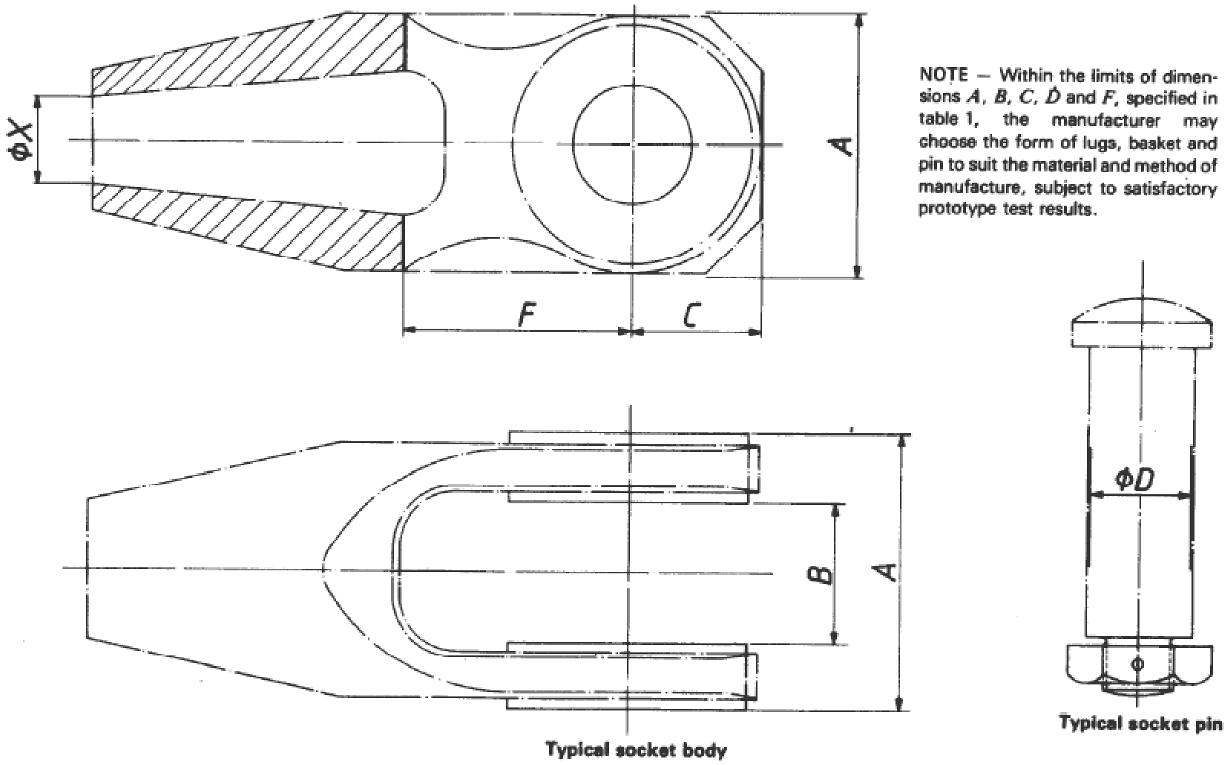
(*Clause* 4.4)

Sl No.	**Basic Design Size** ***n***	**Nominal Rope Diameter** ***d***	***A*** **max.**	***B*** **min.**	***C*** **max.**	***D*** **min.**	***F*** **min.**	***X*** **min.**	***L*** **[Type II (closed) sockets)] min.**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	10	8,9 and 10	45	19	27	16	20	14	43
	12	11 and 12	54	23	32	19	24	16	52
	14	13 and 14	63	27	37	22	28	18	60
	15	16	72	30	42	26	32	20	69
ii)	18	18	81	34	48	29	36	23	77
	20	20	90	38	53	32	40	25	86
	22	22	99	42	58	35	44	27	95
	24	24	108	46	64	38	48	30	103
iii)	28	26 and 28	126	53	74	45	56	34	120
	32	32	144	61	85	51	64	39	138

Sl No.	**Basic Design Size** ***n***	**Nominal Rope Diameter** ***d***	***A*** **max.**	***B*** **min.**	***C*** **max.**	***D*** **min.**	***F*** **min.**	***X*** **min.**	***L*** **[Type II (closed) sockets)] min.**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	38	36	162	68	95	58	72	43	155
	40	40	180	76	106	64	80	48	172
iv)	44	44	198	84	117	70	88	53	189
	48	48	216	91	127	77	96	57	206
	52	52	234	99	138	83	104	62	224
	56	56	252	106	148	90	112	66	241
	60	60	270	114	159	96	120	71	258

The dimensions in the above table are based on the following proportions:

A	$< 4.5\,n$
B	$> 1.9\,n$
C	$< 2.65\,n$
ϕD	$> 1.6\,n$
F	> 2 n
ϕX	$> 1.15\,n + 2$ mm
L	$> 4.3\,n$



NOTE — Within the limits of dimensions *A*, *B*, *C*, *D* and *F*, specified in table 1, the manufacturer may choose the form of lugs, basket and pin to suit the material and method of manufacture, subject to satisfactory prototype test results.

Typical socket body

Typical socket pin

FIG. 1 TYPE 1 (OPEN) SOCKET

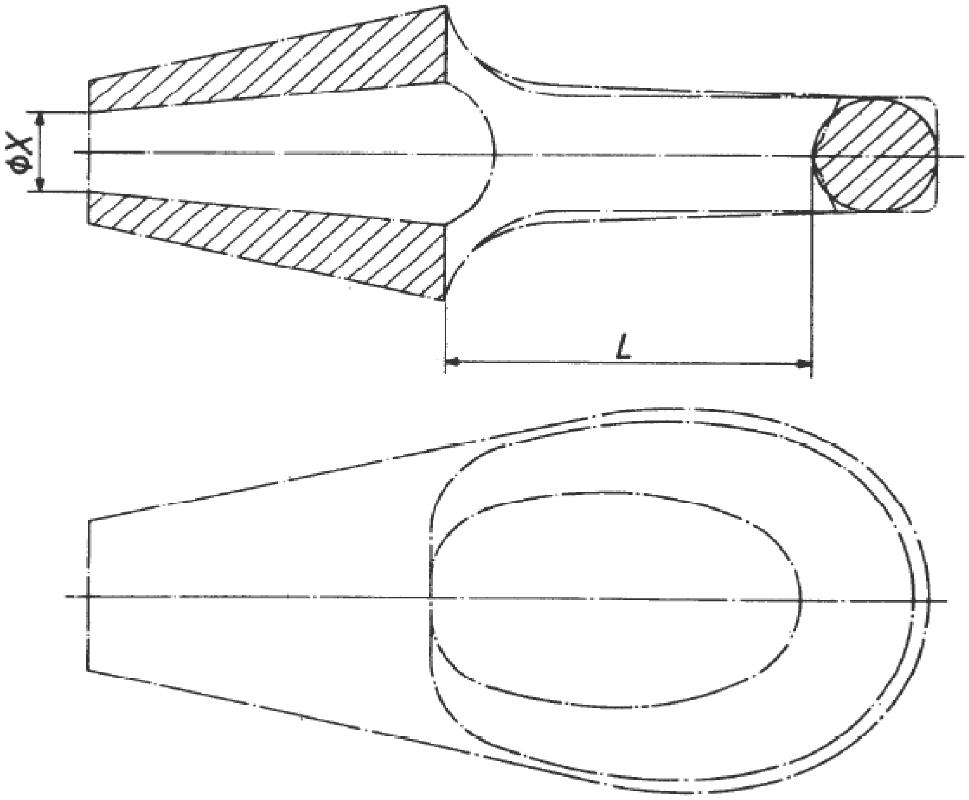


FIG. 2 TYPE 2 (CLOSED) SOCKET

4.5 Quality Control

4.5.1 The manufacturer conforms to as specified in para **4.3** shall ensure that the quality of material used for the production of sockets conforms with the appropriate material specified

4.5.2 Each socket, after manufacture, shall be inspected to ensure that it is free from flaws or defects which would reduce the performance of the socket.

4.5.3 Random samples of each batch shall be taken from each production run and checked for compliance with the dimensional requirements. The number of samples taken shall be in accordance with table 2. If any sample is found to be outside any dimensional requirement, the dimension shall be checked on every socket in the batch.

4.5.4 Records of all quality control measurements and checks shall be kept for at least five years, and shall be made available to the purchaser if so required. The manufacturer shall show evidence of an adequate system of quality control.

Table 2 Sample Size for Quality Control Purposes

(*Clause* 4.5.3)

Sl No.	**Lot or batch size** (Number of sockets)	**Sample size** (Number of sockets)
(1)	(2)	(3)
i)	2 to 13	Each Socket
ii)	14 to 90	13
iii)	91 to 150	20
iv)	151 to 280	32
v)	281 to 500	50
vi)	501 to 1 200	80
vii)	1 201 to 3 200	125
viii)	3 201 to 10 000	200

5 METHOD OF SOCKETING

The method of socketing shall be as specified in

IS No	*Title*
IS 3937 (Part 1) : 1974	Recommendations for socketing of wire ropes — Part 1 Socketing with zinc *(first Revision)*
IS 3937 (Part 2) : 1974	Recommendations for socketing of wire ropes — Part 2 Socketing with white metal *(first revision)*
IS 3937 (Part 3) : 1993	Recommendations for socketing of wire ropes — Part 3 Socketing with resins

6 PROTOTYPE TESTS

Prototype tests are intended to demonstrate that the socket specified by the manufacturer and certified in accordance with Clause 10, and each of the methods of socketing declared as being suitable for use with it, can withstand the maximum loading to be imposed on it under normal conditions of usage.

6.1 Prototype Tests on Sockets

The purpose of these tests is to prove the design, material and method of manufacture of the sockets. Tests to prove socketed assemblies are given in **6.2**.

6.1.1 *Tensile Test*

Two tensile tests shall be carried out on each size of socket of each design, material and method of manufacture. An apparatus suitable for testing type I (open) sockets with machined internal surfaces is shown in Fig. 3. For the type 2 (closed) socket, a suitable device designed to apply the force in a comparable manner shall be used. The force shall be applied in two stages as follows:

Stage 1

A force equal to 40% of the minimum specified breaking force of the strongest rope for which the socket is designed (*see* Table 4) shall be applied and held for 2 min. On removing this force, the socket shall be deemed to have satisfied this stage of the test if, compared with their initial values,

a) The increase in the diameter of the pin hole does not exceed 0.2 percent or 0.l mm, whichever is the greater; in the case of type 2 (closed) sockets, the internal dimensions of the lug shall not have varied by more than 0.2 percent or 0.1 mm, whichever is the greater;

b) The increase in diameter at the socket mouth (QX in table 1) does not exceed 0.2 percent or 0.1 mm, whichever is the greater.

Stage 2

The force shall then be re-applied to the socket and increased quickly to not more than 60 percent of the reference test force given in table 3. Thereafter the force shall be increased slowly until the reference test force has been reached. The socket shall deemed to have satisfied this stage of the test if it shows no evidence of cracking or splitting when subjected to non-destructive testing (NDT) examination, such as magnetic particle inspection. In the case of sockets with pins, the force shall be applied uniformly over the length of the pins, until the value shown in table 3 has been reached.

6.2 Prototype Tests on Socketed Assemblies

These tests are designed to assess the suitability of each design, material and method of manufacture of socket and the declared methods of socketing. Consequently it is also a test of the declared socketing methods.

6.2.1 *Tensile Test*

Two tests shall be carried out on each size of socket of each design, material and method of manufacture and for each nominal diameter of rope, d, given in table 3, using the socketing method in question. When the sockets are tested in pairs, the distance between the inner faces of the sockets shall be at least 30 d. The force may be applied quickly up to not more than 80 percent of the reference test force given in table 3. Thereafter, the force shall be increased slowly until there reference test force has been reached.

This test may be carried out concurrently with that specified in **6.1.1**. In the case of sockets with pins, the force shall be applied uniformly over the length of the pins, until the value shown in table 3 has been reached.

After completion of the test, the rope shall not have moved out of the socket mouth by more than 2 percent of the basket length.

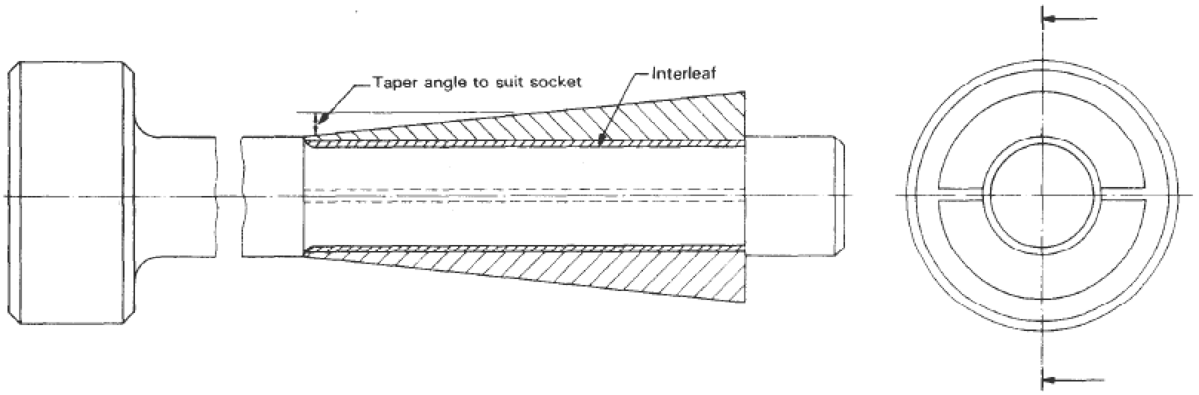


FIG. 3 SPLIT CONE AND STEM FOR TESTING SOCKETS

Table 3 Reference test force

(*Clause* 6.2.1)

Sl No.	Nominal diameter of wire rope *d* mm	Type of rope construction		
		6 × 7 IWR	6 × 19 IWR	6 × 36 IWR
		Reference test force		
		kN	kN	kN
(1)	(2)	(3)	(4)	(5)
i)	8	37	36	–
ii)	9	46	46	46
iii)	10	57	57	57
iv)	11	69	69	69
v)	12	82	82	82
vi)	13	96	96	96
vii)	14	112	112	112
viii)	16	147	145	145
ix)	18	185	184	184
x)	20	–	–	227
xi)	22	–	–	275

Sl No.	**Nominal diameter of wire rope** *d* mm	**Type of rope construction** 6 × 7 IWR **Reference test force** kN	6 × 19 IWR kN	6 × 36 IWR kN
(1)	(2)	(3)	(4)	(5)
xii)	24	–	–	327
xiii)	26	–	–	383
xiv)	28	–	–	445
xv)	32	–	–	581
xvi)	36	–	–	735
xvii)	40	–	–	909
xviii)	44	–	–	1 098
xix)	48	–	–	1 305
xx)	52	–	–	1 539
xxi)	56	–	–	1 782
xxii)	60	–	–	2 043

6.3 Procedure for Re-tests

If any one test piece, subjected to the tests described in **6.1** and **6.2**, fails to pass a test, a further two samples of the same size of each design, material and method of manufacture shall be tested for the characteristics in question. If all of these pass the test, the socket or socketed assembly shall be deemed to have passed the prototype tests. If one or more fail, the socket or socketed assembly shall be deemed to have failed the prototype tests.

7 CONDITION

Each socket shall be supplied either free from any coating, galvanized or coated with an anti-corrosion agent as specified by the purchaser.

8 PROOF TEST

Where required by the purchaser or by national regulations, each finished socket shall be subjected to the proof test force specified in table 4, using the apparatus shown in figure 3 or other suitable apparatus. It shall withstand this proof force with a permanent set of not more than 0.2 % or 0.l mm, whichever is the greater, when measured at the pinhole in the case of the type 1 socket and on the main internal dimensions of the bow of the type 2 socket.

Table 4 Proof test force

(*Clause* 8)

Sl No.	**Basic design size** **mm**	**Proof test force** **kN**
(1)	(2)	(3)
i)	10	25
ii)	12	37
iii)	14	50
iv)	16	65
v)	18	82
vi)	20	100
vii)	22	120
viii)	24	150
ix)	28	200
x)	32	260
xi)	36	330
xii)	40	400
xiii)	44	490
xiv)	48	580
xv)	52	680
xvi)	56	790
xvii)	60	910

NOTE — The proof test force is based on 40 % of the minimum breaking load of the strongest rope, for which the socket is deemed to be suitable. If sockets are to be used subsequently with ropes of higher tensile grades, the proof test force should he appropriately increased.

9 IDENTIFICATION AND MARKING

Each socket shall be legibly and permanently marked with the nominal diameter of rope with which it may be used. When required, the body and the pin shall be permanently marked with such marks or symbols as will provide identification with the manufacturer’s certificate of test. The identification marking shall not affect the performance of the socket.

10 CERTIFICATION

When it is required by the purchaser or necessary to comply with statutory regulations, the manufacturer or supplier shall provide a certificate giving the following information:

a) The name and address of the manufacturer;

b) The identification marks or symbols, as required by clause 9;

c) The type, basic design size (*see* Table 1) and the method of manufacture;

d) The specification of the material from which the sockets were made;

e) The type of final heat treatment given to the sockets (*see* **4.3**);

f) The proof test force applied to the socket;

   1) In prototype testing;

   2) Where required on each socket, if requested by the purchaser or required by national regulations (*see* clause 8);

g) A statement that the sockets are of the same design, material and method of manufacture which has passed the prototype tests given in clause 6;

h) The specific methods of socketing for which the socket is suitable and a statement that these methods of socketing have passed the prototype tests in clause 6;

j) A statement as to whether the sockets and socketing have been tested for use with wire ropes of tensile grade higher than 1 770 N/mm2, if applicable.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Wire Ropes and Wire Products Sectional Committee, MED 10

Organization	*Representative(s)*
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	SHRI R. K. MUNSHI (*Alternate)*
Bharat Wire Ropes Limited, Mumbai	SHRI MAHENDER SINGH ARORA
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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

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